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(54) COMPOSITION FOR REMOVING ADHERING HARDENED CONCRETE AND/OR FOR STRIPPING CEMENTING MATERIALS SUCH AS CONCRETE AND PLASTER

(71) We, IMPROTEC TECHNICAL IMPROVEMENT S.A., a Swiss Body Corporate, of Fribourg, Switzerland, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a composition for removing adhering hardened concrete and/or for stripping cementing materials such as concrete and plaster.

The invention also relates to the process for applying the above-mentioned composition on the surface of objects to be cleaned. The invention also relates to a process for applying the composition on the internal surface of a casing or mould which is to receive the concrete or plaster in order to facilitate the stripping of the hardened concrete or plaster.

It has been noted for a long time that fats of animal or plant origin stored in concrete tanks attack the latter causing it to disintegrate slowly (see, in particular, Tonindustrie Zeitung, vol. No. 100, 1912). This results from attack of the hydrated lime produced upon hydration of the di- and tri-calcium silicates existing in the cement by the glycerides contained in the fats.

The hydration reactions can be written as follows:

$$2\,(SiO_2, 2CaO) + 4H_2O \longrightarrow 2SiO_2, 3CaO, 3H_2O + Ca\,(OH)_2$$

and

$$2\,(SiO_2, 3CaO) + 6H_2O \longrightarrow 2SiO_2, 3CaO, 3H_2O + 3Ca\,(OH_2)$$

The reaction leading to attack of the hydrated lime $Ca\,(OH)_2$ formed occurs as follows:

$$\text{Glycerides} + Ca\,(OH)_2 \longrightarrow \text{Calcium salts} + \text{Glycerine}$$

This reaction, therefore, leads to the formation of calcium salts or calcium soaps sparingly soluble in water which prevent the setting of cement as the following experiment shows:

A mortar consisting of 50% by volume of artificial Portland cement and 50% sand is hydrated with half its volume of water. During the working of this mortar, olein (glyceride of oleic acid) is added as olive oil mixed with an equal volume of gas oil in the proportion of approximately 10% by volume of the mortar.

It is noted that the rise in temperature due to the heat given off by the hydration reaction of the cement is stopped and that the setting of the cement goes no further. Two weeks later, the mortar, instead of being hardened, disintegrates when a sharp object is driven into it.

A comparable result can be obtained by replacing olein with the following glycerides: palmitin, stearin, arachidin, linolein, linolerin, ricinolein, erucin. rapin, added to the mortar as peanut oil, linseed oil, castor oil, rape seed oil, coleseed oil, cotton-seed oil, tall-oil, soybean oil or mustard oil.

However, the thus treated mortar is still too compact and not sufficiently friable for the process to be of any substantial industrial value.

The application of a glyceride or of a composition comprising mineral oil and/or gas oil and a glyceride would not lead to the satisfactory cleaning of a surface with adhering hardened concrete. Similarly, the application of a glyceride or of such a composition on the walls of a casing would not facilitate stripping of the concrete once it has hardened.

An object of this invention is to correct or at least mitigate the above-mentioned drawbacks by providing a composition which makes the concrete friable under slight pressure or slight friction. A further object of the invention being to use this composition for cleaning adhering hardened concrete and/or for the stripping cementing materials such as concrete and plaster

after the application of the composition on the internal surface of the casing or of the mould designed to receive the cementing material such as concrete and plaster.

According to a first aspect of the present invention there is provided a composition suitable for removing adhering hardened concrete and/or for stripping cementing materials such as concrete and plaster, which composition comprises by volume, from 20 to 97% of mineral oil, a total content of from 1 to 79.9% of one or more glyceride(s), and from 0.1 to 3% of wetting agent extract, the extract being one or more of the plant extract(s) saponin, lecithin, glycinin phytosterin and rosin.

According to a second aspect of the present invention there is provided a composition suitable for removing adhering hardened concrete, which composition comprises by volume, from 20 to 45% of mineral oil, a total content of from 40 to 79.9% of one or more glyceride(s) and from 0.1 to 3% of wetting agent extract, the extract being one or more of the plant extracts saponin, lecithin and rosin.

According to a third aspect of the present invention there is provided a composition suitable for stripping concrete of conventional quality, which composition comprises by volume from 85 to 97% of mineral oil, a total content of from 1 to 10% of one or more non-drying glyceride(s), and a total content of from 0.1 to 3% of one or more drying or semi-drying glyceride(s) and from 0.1 to 1% of wetting agent extract, the extract being one or more of the plant extracts saponin, lecithin and rosin.

According to a fourth aspect of the present invention there is provided a composition suitable for stripping dried concrete, which composition comprises by volume, from 85 to 97% of mineral oil, a total content of from 1 to 14% of one or more non-drying glyceride(s) and from 0.1 to 1% of wetting agent extract, the extract being one or more of the plant extracts saponin, lecithin and resin.

According to a fifth aspect of the present invention there is provided a process for removing adhering hardened concrete and/or for stripping cementing materials such as concrete and plaster which process comprises applying a composition in accordance with any one of the first four aspects of the present invention.

According to a sixth aspect of the present invention there is provided a process for facilitating stripping concrete from a casing, which process comprises applying a composition in accordance with any one of the first four aspects of the present invention.

Preferably, the glyceride(s) is/are constituted by vegetable oils.

It has been noted, according to the invention that a number of wetting agents derived from plant fats have the remarkable property of wetting, in a highly satisfactory manner, metal, wooden or plastics surfaces conventionally used as materials in casings or moulds for concrete or plaster.

The wetting agent is derived from plant matter and is chosen from among saponin, lecithin, glycinin, phytosterin and rosin.

It is known that saponin is extracted from saponaria, the quillaia-tree, the Savindus nut, the India chestnut, lecithin and glycinin from soybean oil and that phytosterin and rosin exist in tall-oil.

These products have remarkable wetting properties. Their presence in the composition provides the latter with a definitely increased efficiency and considerably limits the quantity of product to be applied in order to remove adhering hardened concrete and for the stripping of cementing material, such as concrete and plaster.

The wetting properties thereof, make it possible to obtain, upon application to a surface, a uniform film without having to use a substantial quantity of the product. The uniformity of the film is indeed essential in the case, in particular, of the stripping of concrete if it is desired to avoid sharp parts or cavities corresponding to areas on the surface of the casing where the applied film presents a break or, on the contrary, where the thickness is too great.

The wetting agents derived from plant fats are, in addition, remarkable foaming agents: indeed, they produce an abundant foam upon contact with concrete, this foam being produced during saponification of the hydrated lime contained in the concrete. This substantial production of foam causes the superficial layer of the concrete, in intimate contact with the applied composition, to become hollow and, as a result, extremely friable. The same reactions occur with plaster: indeed, anhydrous calcium sulphate is involved which, through hydration upon setting, produces an alkaline medium which enhances the formation of analogous calcium soaps.

The proportion, of plant extract by the way, is limited to a maximum of 3% so as not to excessively attack the superficial layer of the cementing material such as concrete and plaster.

According to a preferred embodiment of the invention, the composition, being more particularly designed for the removal of adhering hardened concrete, contains the following compounds within the limiting proportions by volume indicated below:

– mineral oil having an Engler viscosity of approximately

1.4 at 20°C and/or gas oil : from 20 to 45%
– glyceride : from 40 to 79.9%
– saponin and/or lecithin and/or rosin : from 0.1 to 3%

Among the non-drying glycerides, the glycerides contained in olive, peanut, castor and coleseed oil are preferred.

The above-mentioned composition is in the form of a low viscosity liquid which makes it possible to spray it easily with an atomizer.

According to another preferred embodiment of the invention, the composition being more particularly designed for stripping concrete of conventional quality, the following compounds are mixed within the limiting proportions by volume indicated below:

– mineral oil having an Engler viscosity of approximately 1.4 at 20°C and/or gas oil : from 85 to 97%
– non drying glyceride : from 1 to 10%
– drying or semi-drying glyceride : from 0.1 to 3%
– saponin and/or lecithin and/or rosin : from 0.1 to 1%

It was noted that it is advantageous to add a drying or semi-drying glyceride simultaneously with the non-drying glyceride and other components of the composition; since, this composition, once applied to the walls of the casing must not be washed out by rain when the casing is not protected. The phenomenon of washing out which would be harmful to the stripping of concrete is eliminated when the composition contains a drying or semi-drying glyceride such as the glycerides contained in linseed, tall, rape, mustard, cotton-seed and soybean oil.

According to a third preferred embodiment of the invention, the composition being more particularly designed for the stripping of dried concrete, the following components are mixed within the limiting proportions by volume indicated below:

– mineral oil having an Engler viscosity of approximately 1.4 at 20°C and/or gas oil : from 85 to 97%
– non-drying glyceride : from 1 to 14%
– saponin and/or lecithin and/or rosin : from 0.1 to 1%

As far as dried concretes are concerned, the action of the drying or semi-drying glyceride has been found to be harmful, especially when drying is carried out at temperatures of the order of 70°C. It is to be noted, however, that, in this case. washing out of the applied composition is not to be tolerated, the concretes being normally prepared and introduced in the casing away from rain.

As far as architectural concretes obtained using white cement are concerned, it was shown, in addition, that the fluid mineral oil and/or gas oil used should preferably contain a maximum of 0.4% by weight of sulphur.

Indeed, a higher sulphur content gives rise on the surface of the concrete, after stripping, to green-yellow coloured spots.

The following Examples further illustrate the present invention.

The Examples below are tests which were carried out under covered premises at a room temperature of 20°C; the casings were coated with the composition according to the Examples below by spraying with an atomizer one hour before casting the concrete and the stripping was carried out 48 hours after the introduction of the concrete.

EXAMPLE I

The concretes employed were prepared using ordinary cement such as: artificial Portland, slag, quick setting, pozzolanic and fly ash cement.

The mixture applied on the casing was as follows:

– mineral oil having an Engler viscosity of 1.4 at 20°C : 45%
– gas oil : 50%
– olive oil : 3.9%
– linseed oil : 1%
– saponin : 0.1%

The mixture applied as a coating was not washed out by a spray of water applied for one half hour. No adhering matter was noted upon stripping.

Identical results were obtained by replacing, in particular, olive oil with peanut oil, linseed oil with tall-oil and saponin with lecithin or rosin.

EXAMPLE II

The concretes employed were prepared using ordinary cement such as: artificial Portland,

slag, quicksetting, pozzolanic and fly ash cement.

The concrete was dried for two hours at 70°C.

The composition of the mixture was as follows:

- mineral oil having an Engler viscosity of 1.4 at 20°C : 45%
- gas oil : 50%
- peanut oil : 4.9%
- rosin : 0.1%

Upon stripping, no adhering matter whatsoever was noted on the casing.

EXAMPLE III

The concrete was prepared from white cement. The composition of the mixture applied was as follows:

- mineral oil having an Engler viscosity of 1.4 at 20°C and with a sulphur content of less than 0.4% by weight : 45%
- gas oil with a sulphur content of less than 0.4% by weight : 50%
- olive oil : 3.9%
- tall-oil : 1%
- lecithin : 0.1%

Upon stripping, no adhering matter whatsoever was noted and the surface of the concrete was spotless.

The efficiency of the composition obtained according to the process of the invention was also determined for cleaning adhering hardened concrete.

The same composition can be advantageously used for stripping plaster. Adhering matter is eliminated. In addition, the whiteness of the plaster is maintained.

EXAMPLE IV

The surface of the internal wall of a casing showing many parts of adhering hardened concrete was spray-coated using the following composition:

- gas oil : 20%
- olive oil : 19%
- tall-oil : 60%
- rosin : 1%

It was noted two hours after application of the composition that the adhering concrete became extremely friable; it broke up, for example, upon rubbing it slightly with a finger.

It is clear that the invention is not limited to the Examples mentioned above. The compositions can, in particular, be used on all casing materials used in the building industry.

WHAT WE CLAIM IS:—

1. A composition suitable for removing adhering hardened concrete and or for stripping cementing materials such as concrete and plaster, which composition comprises by volume from 20 to 97% of mineral oil, a total content of from 1 to 79.9% of one or more glyceride(s), and from 0.1 to 3% of wetting agent extract, the extract being one or more of the plant extract(s) saponin, lecithin, glycinin, phytosterin and rosin.

2. A composition suitable for removing adhering hardened concrete, which composition comprises, by volume, from 20 to 45% of mineral oil, a total content of from 40 to 79.9% of one or more glyceride(s) and from 0.1 to 3% of wetting agent extract, the extract being one or more of the plant extracts saponin, lecithin and rosin.

3. A composition suitable for stripping concrete of conventional quality, which composition comprises, by volume, from 85 to 97% of mineral oil, a total content of from 1 to 10% of one or more non-drying glyceride(s), a total content of from 0.1 to 3% of one or more drying or semi-drying glyceride(s) and from 0.1 to 1% of wetting agent extract the extract being one or more of the plant extracts saponin, lecithin and rosin.

4. A composition suitable for stripping dried concrete, which composition comprises by volume from 85 to 97% of mineral oil, a total content of from 1 to 14% of one or more non-drying glyceride(s) and from 0.1 to 1% wetting agent extract, the extract being one or more of the plant extracts saponin, lecithin and rosin.

5. A composition according to Claim 1 or 2, wherein the glyceride(s) is/are constituted by vegetable oils.

6. A composition according to Claims 1, 2 or 5, wherein the glyceride(s) is/are non-drying glyceride(s) and /or drying or semi-drying glyceride(s).

7. A composition according to any one of Claims 3, 4 and 6 containing non-drying glyceride(s), the non-drying glyceride(s) being one or more of olive oil, peanut oil, castor oil and coleseed oil.

8. A composition according to any one of Claims 3 and 6 containing drying or semi-drying

glyceride(s), the drying or semi-drying glyceride(s) being one or more of linseed oil, tall oil, rape-seed oil, mustard oil, cotton-seed oil and soybean oil.

9. A composition according to any one of the preceding claims, suitable for stripping white concretes and plaster, which composition comprises mineral oil containing a maximum of 0.4% by weight of sulphur.

10. A composition for removing and/or stripping, substantially as described in foregoing Example I.

11. A composition for removing and/or stripping, substantially as described in foregoing Example II.

12. A composition for removing and/or stripping, substantially as described in foregoing Example III.

13. A composition for removing and/or stripping, substantially as described in foregoing Example IV.

14. A process for removing adhering hardened concrete and/or for stripping cementing materials such as concrete and plaster which process comprises applying a composition in accordance with any one of the preceding claims on a surface to be cleaned.

15. A process for removing adhering hardened concrete, which process comprises applying the composition in accordance with Claim 2, onto a surface to be cleaned.

16. A process for facilitating stripping concrete from a casing, which process comprises applying a composition in accordance with any one of Claims 1 to 13 onto an internal surface of the casing.

17. A process according to Claim 14, 15, or 16, wherein the composition is applied by spraying.

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